

INFORMATION ON AGM BATTERIES

AGM: Absorbed (Fiber)Glass Mat separated plate construction

AGM batteries are:

- * Maintenance free so you don't have clean terminals or check fluid levels
- * Corrosion free so you can safely use it indoors
- * No special handling makes for easy shipping
- * Tough construction of impact resistant, plastic makes the casing hard to break
- * 3-7 year battery life means you won't have to replace your battery as often
- * Low discharge rate during storage gives you an exceptionally long shelf life
- * Deep discharge recovery capable ensures full capacity if not deep discharged too often
- * Maintains charge better in all temperature extremes to prevent power loss in the cold

Deep cycle AGM marine batteries are sometimes referred to as dry cell batteries, non-spillable batteries, regulated valve batteries, or maintenance free batteries. They are often interchangeable with gel cell batteries. If you currently are using a GEL battery it can usually be replaced by an AGM model. You however cannot replace an original AGM battery with GEL cells.

AGM Advantages:

All AGM batteries boast some significant performance enhancement over traditional flooded lead acid cells:

- * AGM construction allows purer lead in the plates as each plate no longer needs to support its own weight based on the sandwich construction with AGM matting. Traditional cells must support their own weight in the bath of acid.
- * un-spillable
- * high specific power or power density, holding roughly 1.5x the AH capacity as flooded batteries based on purer lead
- * low internal resistance allowing them to be charged and discharged quite rapidly
- * these batteries when left unattended only self discharge at the rate of up to 3% per month, and even after 12 months sitting idle can be recharged and put back into full service without any ill effects. On the other hand a standard wetted deep cycle battery if treated the same way will have destroyed it's self (sulfation), it will no longer hold a good charge.
- * never requiring addition of water-no maintenance required
- * acid is encapsulated in the matting
- * will operate well below 0°F or -18 °C.
- * UL, DOT, CE, Coast Guard, and Mil-Spec approved types
- * vibration resistant based on the sandwich construction.
- * Terminals don't corrode.

AGM Disadvantages:

- * Cost. AGM automobile batteries for example, are typically about twice the price of flooded-cell batteries in a given BCI (Battery Council International) size group.
- * AGM batteries have up to a 10 year life span, but must be sized to discharge less deeply than the traditional flooded batteries. For an AGM battery, the depth of discharge for optimal performance is 50%, but flooded batteries can be rated up to 80% depth of discharge.
- * AGM batteries do not tolerate overcharging. Overcharging dissociates the water in the electrolyte, which is unable to be replaced, leading to premature failure.

However, proper charge control and protection is much more important with VRLAs because once fried it is impossible to revive them. (**valve-regulated lead-acid** battery-**VRLA** battery- sometimes called sealed lead-acid (SLA), gel cell, or maintenance free battery.)

Battery Comparison:

1. Differences between AGM and flooded lead acid batteries (Flooded means traditional liquid acid filled batteries, like what has been used in car or boat batteries forever):

- * AGM batteries have thin, sponge-like, glass mat separators that absorb all liquid electrolytes.
- * Flooded lead acid batteries have free, liquid electrolyte all around the plates and separators.
- * Flooded lead acid batteries can easily release gas that is formed during a charge, while AGM battery life is diminished if gas is formed during charging.

2. Similarities between AGM and flooded lead acid batteries:

- * Both share the exact same lead acid chemistry.
- * Both share the same charge and discharge principles.
- * Both are safely charged by vehicle charging systems.
- * When discharged, both can be recharged at high current levels.

Battery Charging Information:

Damage to AGM batteries becomes an issue when the charge rate is not monitored and controlled by the charger (i.e., quick chargers). The performance of an AGM battery can be irreversibly reduced if the charge rate remains too high, allowing the battery to overheat and vent. Once an AGM battery loses water (venting), the glass mats will become dry, causing the battery to lose conductance, power and performance.

The charging voltages are the same as for any standard battery - no need for any special adjustments or problems with incompatible chargers or charge controls. And, since the internal resistance is extremely low, there is almost no heating of the battery even under heavy charge and discharge currents.

The voltage used in charging this battery is just the same with any usual battery. There making adjustment is not anymore necessary. No issues pertaining to incompatibility of chargers. When charging, overheating is does not occur even when left charged for a long time because it has a low internal resistance. AGM's have a very low self-discharge - from 1% to 3% per month is usual. This means that they can sit in storage for much longer periods without charging than standard batteries.

AGM: The Absorbed Glass Mat construction allows the electrolyte to be suspended in close proximity with the plates active material. In theory, this enhances both the discharge and recharge efficiency. Common manufacturer applications include high performance engine starting, power sports, deep cycle, solar and storage battery. AGM batteries are typically good deep cycle batteries and they deliver their best life performance if recharged before allowed to drop below the 50% discharge rate. When Deep Cycle AGM batteries are discharged to a rate of no less than 60% the cycle life will be 300 plus cycles.

In most vehicle charging systems, the alternator limits the charging rate by limiting the output voltage (about 14.4V). For example, an AGM battery may be observed charging at 60A and 13.5V. As the battery recharges, the charging voltage will increase from 13.5V to approximately 14.4V (voltage will vary based on temperature, control sophistication, etc.), and the current will decrease from 60A to about 0A. The charging system voltage regulators prevent both AGM and flooded lead acid batteries from being overcharged and venting. By controlling the voltage, the charging rate (current) can be controlled.

AGM batteries are just like flooded lead acid batteries, except the electrolyte is being held in the glass mats, as opposed to freely flooding the plates. Very thin glass fibers are woven into a mat to increase surface area enough to hold sufficient electrolyte on the cells for their lifetime. Nearly all AGM batteries are "recombinant" - what that means is that the Oxygen and Hydrogen recombine INSIDE the battery.

The plates in an AGM battery may be any shape. Some are flat, others are bent or wound. AGM batteries, both deep cycle and starting, are built in a rectangular case to BCI (Battery Council International) battery code specifications. Optima Battery builds a patented cylindrical AGM series of batteries that are fashioned to fit the same BCI battery size specifications as any other battery.

APPLICATIONS:

Many modern motorcycles on the market utilize AGM or factory-sealed AGM batteries for the combined benefits of reduced likelihood of acid spilling during accidents, and for packaging reasons (lighter, smaller battery to do the

same job; the battery can be installed at an odd angle if needed for the design of the motorcycle).

Due to the higher manufacturing costs compared with flooded lead-acid batteries, AGM batteries are currently used on premium vehicles. As vehicles become heavier and equipped with more electronic devices such as navigation, stability control, and premium stereos, AGM batteries are being employed to lower vehicle weight and provide better electrical reliability compared with flooded lead-acid batteries.

AGM -vs- GEL Sealed Batteries

The following applies to most sealed lead batteries.

AGM (absorbed glass mat) batteries are designed to hold the electrolyte in the mats so that if the battery is broken the acid does not leak out.

GEL (Congealed electrolyte) batteries are filled with silica type gels that suspend the electrolyte allowing flow between mats. These batteries will also not leak if the battery is broken.

Both batteries are non-spillable, maintenance free, deep cycle, may be used in any position, have low self-discharge rates, safe for use in low ventilated areas, and can be transported by ground or air.

AGM batteries are more popular than GEL and offer a higher burst of amps. Life expectancy (cycle lives) remains excellent in AGM as long as batteries are not discharged past 60% between recharges.

GEL batteries are usually more expensive and do not offer the same power capacity as the same physical size AGM. (example U1 AGM=35AH, U1 GEL=32AH). GELs do better in slow discharge rates and slightly higher ambient operating temperatures. One disadvantage to the GEL battery is the charge profile. GEL cells must be recharged properly or the battery may prematurely fail. The charger must be designed or adjustable for GEL cells since they use lower charging voltages.

AGM AND GEL Features

Maintenance-Free Valve Regulated Rechargeable AGM/GEL Sealed Lead Acid Batteries

Important Battery Charging Information

- * Overcharging a sealed lead acid AGM battery will result in permanent damage and reduced capacity.
- * Discharging a battery even slightly below its fully discharged voltage shortens its life. Letting a battery sit and self discharge to 0 destroys the battery.
- * Fully discharging a battery to zero volts, just once, will render a battery unusable.
- * Leaving a sealed lead acid AGM battery in a discharged state will permanently reduce its capacity.
- * Using a fully automatic battery charger is recommended when charging a sealed lead acid AGM Battery.
- * An automatic charger will switch to a float charge when the battery is full/charged. The float charge will keep the battery in peak condition.
- * It is not recommended to use trickle chargers or automobile chargers on AGM batteries. If not monitored closely, a trickle charger can overcharge a sealed lead acid AGM battery. An automobile charger will permanently damage a sealed lead acid AGM battery.